



Exploring Earth and Beyond **FameLab USA 2012-2016**



International
FameLab

Executive Summary

It is widely understood that scientists who communicate about their work and know how to do it well are a benefit to society. The NASA Astrobiology Program brought FameLab to the United States as an expression of this understanding. FameLab has been implemented by NASA and its partners in the US since 2012, with a focus on providing high-quality training for participants. The impacts of the FameLab experience on participants have been studied extensively, and results from these analyses are summarized here and presented in detail below. The overall conclusion is that improving and expanding communication skills and attitudes has changed how participants value communicating about their work.

Significant gains in skills for all participants were documented, especially their ability to make better connections with audiences and use thematic structural elements to organize a

presentation. Participants reported gaining confidence in their ability to communicate, and to self-identify as “science communicators” as well as “scientists.” They also reported that the FameLab experience impacted the likelihood that they would look for communications opportunities, and meet challenges presented by their home institution or employment environment.

Participants were motivated to enter FameLab USA because they knew that communicating about their science is important. Their FameLab experience has transformed this understanding from “that I communicate is important” to “how I communicate is important.” They have come to understand their skills in a new way—they have learned why effective communication facilitates a connection with and makes a difference to their audiences.

Improving and expanding communication skills and attitudes leads to lasting effects on how participants value communicating about their work.

SKILLS

I can craft a theme.

I can deliver a message.

I can connect with an audience.

I can turn fear into energy.

I can do this

I am doing this

I am overcoming barriers.

I am connecting with my audience.

BEHAVIOR

I am looking for more opportunities to communicate.

I'm good at this.

I see myself as a science communicator.

I feel confident.

ATTITUDE

FameLab USA has produced scientists who are better at communicating their work and are more likely to do so throughout their careers. These results reflect NASA's commitment to transformative science communication.





“Because science communication...is essential not just for explaining our research to the public, but for contributing to humanity...I am here to practice telling my own piece of the human story.”

FameLab USA Season 1 participant



NASA's Motivation: When Scientists Communicate Their Research, Everyone Wins

The NASA Astrobiology Program is committed to fostering a community of scientists who value communicating about their work with public audiences, and to helping scientists gain the skills they need to do it well. Because astrobiology is an interdisciplinary science that addresses big questions of relevance to all of humanity – Are we alone in the universe? How did life originate and evolve? – astrobiologists must be able to explain their work to scientists in disciplines outside their own—an ability that also facilitates communication with a diverse set of audiences, including stakeholders policy-makers, and citizens.

When scientists communicate about their work to public audiences, they are contributing to scientific literacy broadly. Taxpayers gain insight into how tax dollars are being spent, journalists can report on science clearly, and educators are better prepared to cultivate

future scientists. Because science and technology play a central role in daily life, the US National Science Foundation (NSF) collects extensive data on public understanding of science. These data show that many Americans have difficulty answering relatively simple questions about science and technology.¹ Underscoring the need for improved understanding of science in society, former Secretary of the Smithsonian Institution, Wayne Clough, calls scientific literacy “a shared responsibility.”² He calls for a coordinated effort involving scientists, educators, museums, universities, non-profit organizations, families, and others to work together to improve scientific literacy. Journalism has a critical role to play, too. The public’s increasing reliance on the ever-growing volume of information available via mass media is reshaping the ways in which we acquire knowledge and understanding of science.^{1,3}

For these reasons, in 2012 NASA brought FameLab to the United States for the first time. The overarching goals were to:

- Encourage early-career scientists to embed the value of communicating about their work throughout their careers,
- Help them to become better at communicating about their work, and
- Showcase the value of good science communication within the broader scientific community.

“Scientific literacy is an urgent and important issue. Why should we care? The answer is simple: our way of life and our survival are at stake.”

Wayne Clough, 12th Secretary of the Smithsonian Institution



FameLab USA: Who, What, Where, When, How



FameLab is an international science communication competition organized by the UK-based Cheltenham Science Festival and implemented in nearly 30 countries worldwide. It's a fun-filled event of competition, coaching, and camaraderie in which early-career scientists from diverse scientific disciplines craft a three-minute talk on their research and deliver it in a supportive environment to judges who provide constructive feedback. No slides, no charts—just the power of words and any prop they can hold in their hands.

FameLab USA consisted of three “Seasons” of competition (see Figure 1). Season 1 (2012; 4 heats) used Astrobiology as its central theme and served as a pilot. Seasons 2 (2012-2014; 6 heats) and 3 (2014-2016; 6 heats) had the theme of “Exploring Earth and Beyond” and benefitted from the extensive formative evaluation studies conducted in Season 1. Online heats were held in Seasons 1 and 2.



NASA used a regional heat model similar to the ones used by other countries implementing FameLab. Regional heats spanned one to three days depending on a variety of factors. At each heat, a preliminary competition led to a down-selection and final competition, producing a Regional Winner. Regional Winners advanced to the National Final, a gala public event preceded by a two-day Master Class for the finalists delivered by a certified FameLab trainer from the UK. The US National Winner then advanced to the International Final in 2012, 2014, and 2016.

Between preliminary and final rounds at each regional heat, participants attended a

communication-training workshop that highlighted relevant research from social science, cognitive psychology, and neuroscience that explains how and why people learn and retain information. The trainings also focused on organizing a talk according to thematic structural elements, and how to best connect to one’s audience—directly addressing the FameLab judging criteria Clarity and Charisma, respectively (see below for more on judging criteria). Video recordings of the talks and judges’ feedback were provided to the participants to facilitate further reflection and learning.

Season 1



Season 2



Season 3

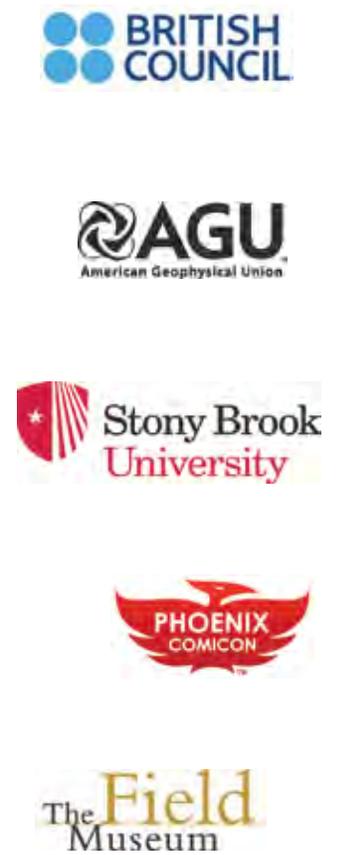


Figure 2. FameLab USA Partners



Partnerships

The cornerstone of the FameLab model in the US has been partnership. While NASA maintained a leadership role, every aspect of implementation—especially participant recruitment and event production—was conducted in partnership with other organizations, including science museums, professional scientific societies, and research organizations (see Figure 2). When approached about participating, prospective partners embraced the FameLab mission and readily offered

resources to ensure its success—a strong indication that they shared the desire to support scientists to communicate about their research.

A key aspect of the partnership strategy was to hold events in conjunction with large scientific conferences, which addressed NASA's goal of raising awareness of the value of communication within the broader scientific community. This strategy also helped to



minimize travel costs since many FameLab participants were also conference attendees.

NASA received numerous offers to implement regional heats at science festivals, conferences, and universities—more requests for partnership than could be accommodated. However, four regional heats in Seasons 2 and 3 were held in response to prior FameLab participants who championed FameLab at

their home institutions and gained support for it: Phoenix, AZ (in partnership with Phoenix ComiCon), Troy, NY (in partnership with the Astrobiology Graduate Conference), Stony Brook, NY (in partnership with the Alan Alda Center for Communicating Science), and San Juan, Puerto Rico (in partnership with the University of Puerto Rico and Arecibo Observatory). Prior FameLab participants have also served as judges.



Content—Clarity—Charisma: Revising the Judging Criteria

After two seasons of working with the judging criteria provided by FameLab International, it was decided that revisions were necessary in order to bring them further into alignment with NASA's goals, as well as the principles conveyed in the communications-training workshops and Master Classes. For example, rather than characterizing Charisma as a quality that a person either has or does not have, it was conceived of as a presenter's ability to connect to one's audience. In that context, Charisma becomes a skill that one can improve with practice.

Clarifications were made to the definition of Content to guide FameLab participants to take on more sophisticated scientific concepts. Also, when the judging panel did not sufficiently balance expertise in science and communication, a special "consultant" to the judging panel was instituted who tracked the



Charisma, as defined by FameLab USA, is a skill that can be improved with practice!

scientific accuracy of presentations and reported any errors to the judges during their deliberations. The definition of Clarity was expanded to highlight the kinds of thematic organizing principles taught in the workshops. These revisions aligned the Judging Criteria more closely with NASA's goal of encouraging all scientists—not just those with natural talent—to become better communicators.

FameLab USA's judging criteria support NASA's goal to develop the skills of all participants, not just those with natural talent.

Participants



Participants

In FameLab USA's three Seasons, 247 young scientists from across the nation (see Figure 3) participated in the FameLab experience. 79% of participants were US citizens, and 21% were foreign nationals affiliated with US-based institutions, representing 19 countries including Colombia, India, Israel, Mexico, Nepal, Peru, and Sri Lanka.

- SEASON 1**
- 1 - 2 participants
 - 3 - 6 " "
 - 7 - 10 " "
- SEASON 2**
- 1 - 2 participants
 - 3 - 6 " "
 - 7 - 10 " "
- SEASON 3**
- 1 - 2 participants
 - 3 - 6 " "
 - 7 - 10 or more

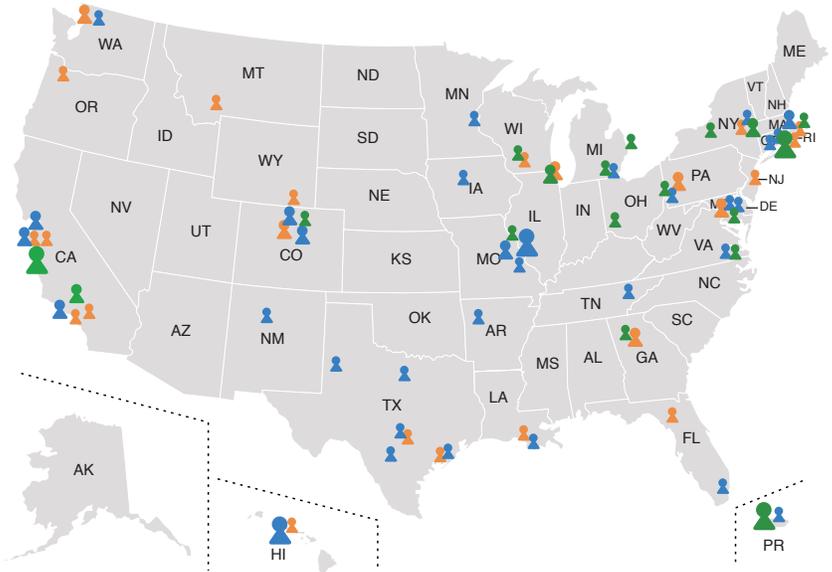


Figure 3. Locations of FameLab USA participants' home institutions

Participants hailed from many different scientific disciplines (see Figure 4a), spanned the early-career spectrum of experience (see Table 1), and represented both genders nearly evenly (see Figure 4b).

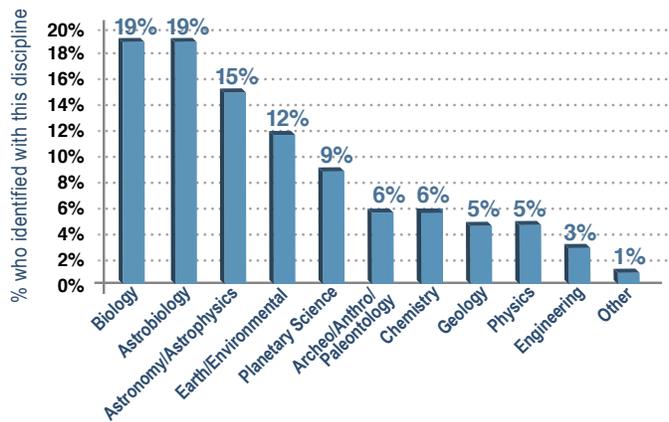


Figure 4a. FameLab USA participants' scientific disciplines (N=247)

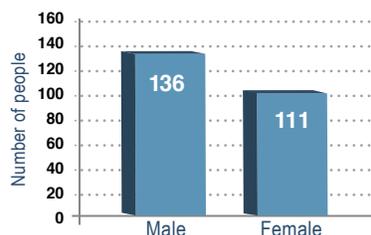


Figure 4b. FameLab USA participants' gender profile (N=247)

PhD student	44%
Graduate Student	21%
Postdoctoral Fellow	14%
Post-PhD researcher or academic appointment	7%
Employed in science (other)	7%
Undergraduate	7%

Table 1. FameLab USA participants' level of academic and/or work experience (N=247)



Assessing the Impact of FameLab USA

Defining Goals and Objectives

Documentation of achievement of goals, through programmatic evaluation and assessment of outcomes and impacts, is vital to the continued support of activities like FameLab. In addition to extensive formative evaluation in Season 1 to inform subsequent implementations, NASA undertook the documentation of FameLab’s impact on participants, and deployed an evaluation plan utilizing mixed methodologies including pre- and post-surveys, retrospective analyses, and external expert analyses.^{4,5}

Outcomes to be assessed, and the subsequent selection of methodologies through which to source data toward those assessments, were derived by triangulating NASA’s goals, the objectives of FameLab participants, and challenges identified by participants at registration.

NASA’s goals:

- **Encourage scientists to embed the value of communicating their work throughout their careers**
- **Support scientists to become better at communicating their work**

The theory of change guiding NASA’s assessment of FameLab USA:

When communication skills and attitudes improve and expand, participants will value communicating their work throughout their careers, and seek out and create opportunities to communicate.

When asked during online registration what they would like to gain from their FameLab experience, participants cited the following objectives, noting multiple factors (N=195).

- 90%** Improve overall ability as a science communicator for the purposes of communicating with other scientists, the public, and the press; presenting theses; and career enhancement
- 28%** Network with other early-career scientists to learn from each other, share science, and create bonds for future collaboration
- 20%** Learn from experts, training workshops, and constructive criticism and feedback from judges and peers



“ I like communicating science to the public because it keeps science alive. ”

“ I want to move discourse to a place that is respectful of and inspired by the scientific process. ”

FameLab USA Season 1 participants

Participants were also asked at registration to identify the challenges they have faced in engaging in public science communication. Participants noted multiple factors, the most common being a lack of time (N=128).

- 34%** Lack of Time
- 25%** Lack of Support from Home Institution/Employer
- 22%** Lack of Confidence
- 16%** Lack of Knowledge about How to Get Involved
- 16%** Lack of Opportunities
- 8%** Lack of Resources



Changes in Attitudes + New Skills = Long-Term Commitment to Science Communication

By way of setting a baseline from which to measure change, participants were asked at the time of registration to describe any prior experience with public science communication. Their responses were binned into four categories: no experience, and low-, mid-,

and high levels of experience. The data indicate that the majority had little or no prior experience, which may reflect low initial self-assessments of skill and confidence (N=215).

- 29%** No Experience
- 45%** Low Level: a few experiences such as classroom visits or youth summer camps
- 22%** Mid Level: one or two experiences presenting their work in a public venue, or a number of experiences such as with students in classrooms
- 4%** High Level: multiple experiences presenting to public audiences, or appearances on television shows, or numerous experiences such as with students in classrooms



FameLab USA Participants Increased their Communication Skills

To assess gains in communication skills imparted by the FameLab experience, a retrospective survey was administered immediately following the training workshop in five of the six regional heats of Season 3. Participants were asked to rate their ability both before and after the

workshop in three skill areas—each of which aligns to the principles taught in the workshop and to the judging criteria of Clarity and Charisma. Participants used a scale of 1-10 (see Figures 5a-c). Data show prominent gains in participants' skill levels.



Making Content Relevant to my Audience (Charisma)



92% of participants' self-ratings were higher
8% of participants' self-ratings stayed the same

Using a Theme to Structure a Presentation (Clarity)



97% of participants' self-ratings were higher
3% of participants' self-ratings stayed the same

Crafting and Delivering a Strong Theme (Clarity)



97% of participants' self-ratings were higher
3% of participants' self-ratings stayed the same

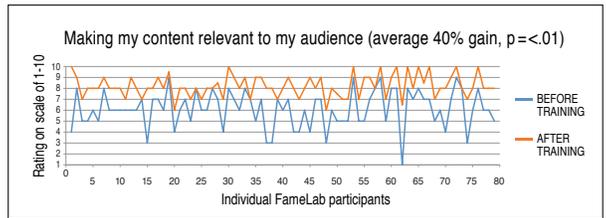


Figure 5a. FameLab USA participants' self-ratings of their ability to make content relevant to their audience (Charisma) before and after the workshop (N=79)

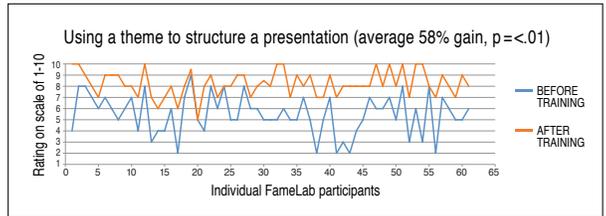


Figure 5b. FameLab USA participants' self-ratings of their ability to use a theme to structure a presentation (Clarity) before and after the workshop (N=61)

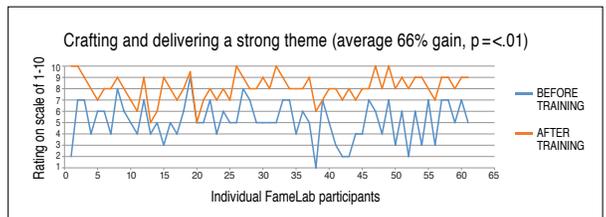


Figure 5c. FameLab USA participants' self-ratings of their ability to craft and deliver a strong theme (Clarity) before and after the workshop (N=61)



In addition to self-reported data, an expert analysis of changes in skill levels was performed by the training workshop instructor in two of the six heats of Season 3. In this analysis, participants' skills were rated in four areas—each of which maps to the principles taught in the workshop, and to the Clarity judging criterion. Presentations of those participants who competed in both the preliminary and final rounds of competition were rated using a scale of 1-5 (see Figures 6a-d). These participants had already been selected by the judges to advance to the next round of competition, indicating that their overall abilities in Content, Clarity, and Charisma were already high. Despite this, data show that the majority of participants further improved their skills.

- ▶ Message/Theme is Expressed Clearly and Consistently
 - 14** expert ratings increased after training
 - 3** expert ratings stayed the same after training
 - 2** expert ratings decreased after training
- ▶ Terminology Used is Appropriate for the Audience
 - 14** expert ratings increased after training
 - 5** expert ratings stayed the same after training
- ▶ Questions are Used Appropriately to Engage Audience
 - 13** expert ratings increased after training
 - 5** expert ratings stayed the same after training
 - 1** expert rating decreased after training
- ▶ Props or Examples are Used Appropriately to Help Audience Understand Content
 - 12** expert ratings increased after training
 - 6** expert ratings stayed the same after training
 - 1** expert rating decreased after training

▶ FameLab USA Participants: Changing Attitudes

Because many participants identified “lack of confidence” as a challenge to their previous experience with public science communication, participants were asked in a retrospective survey administered several weeks after their regional heats to rate their level of confidence as science communicators before and after FameLab (see Figure 7). Data show a marked trend toward increased confidence.

Confidence before FameLab:
54% High or Somewhat High
31% Neither High nor Low
15% Low or Somewhat Low

Confidence after FameLab:
83% High or Somewhat High
9% Neither High nor Low
8% Low or Somewhat Low

“ I feel confident that I am a science communicator and that I can do so for multiple audiences. ”

FameLab USA Season 3 participant in San Juan, Puerto Rico heat

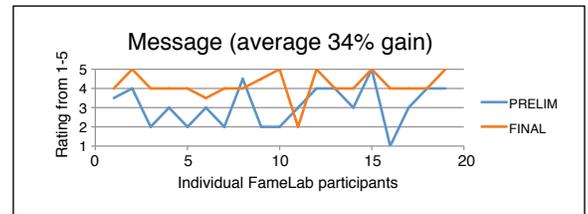


Figure 6a. Expert ratings of how clearly and consistently a message is expressed in FameLab USA talks (N=19)

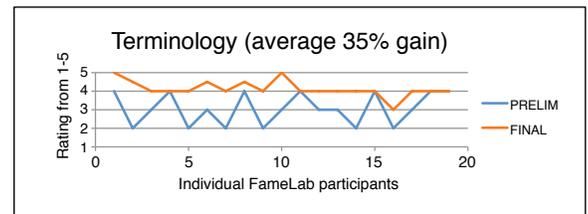


Figure 6b. Expert ratings of how terminology is used in FameLab USA talks (N=19)

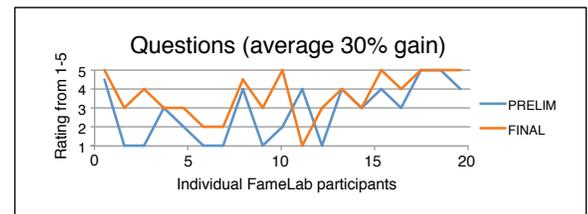


Figure 6c. Expert ratings of how questions are used in FameLab USA talks (N=19)

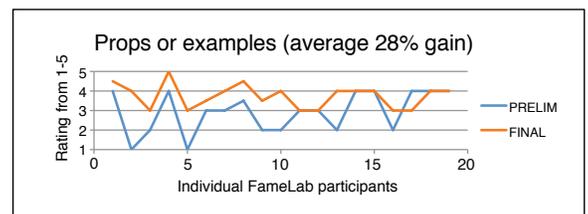


Figure 6d. Expert ratings of how props or examples are used in FameLab USA talks (N=19)

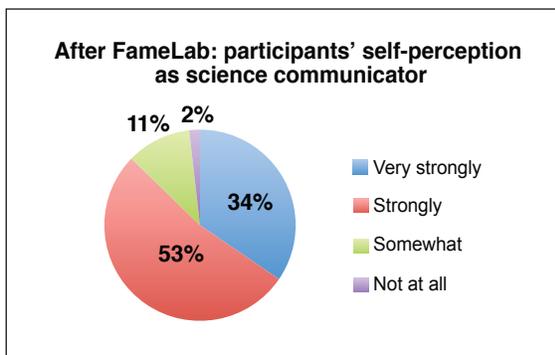
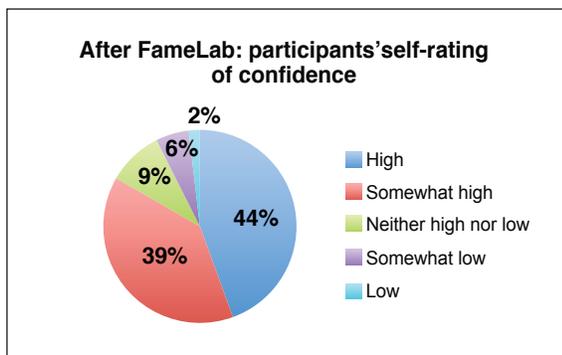
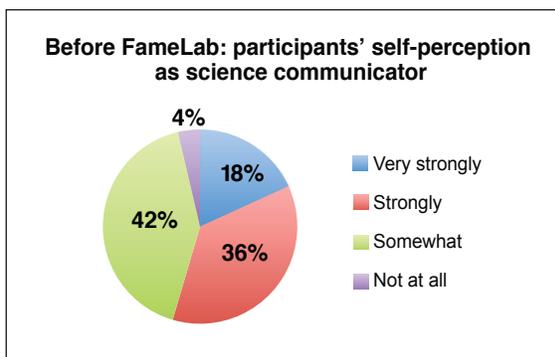
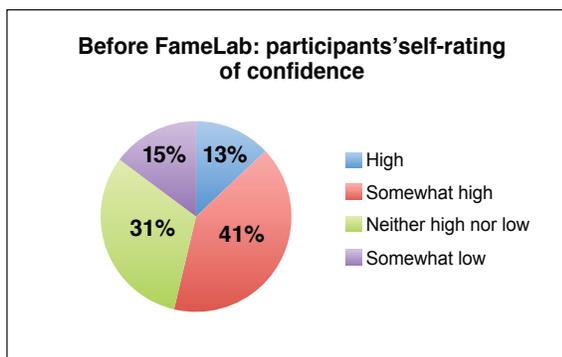


Figure 7. FameLab USA participants' ratings of confidence as science communicators before and after their FameLab experience (N=54)

Figure 8. FameLab USA participants' self-perceptions as science communicators before and after their FameLab experience (N=55)



Research has shown that positive changes in skill levels can lead to changes in self-identity.⁶ In the same retrospective survey, participants were asked to describe, on a scale from Not at All to Very Strongly, how FameLab affected their perceptions of themselves as “science communicators,” before and after FameLab (see Figure 8). Data show a marked shift toward stronger identification as science communicators.

While the competition element of the FameLab experience serves as the general organizing principle, effects a learning environment via judges' feedback and constructive criticism, and infuses energy and excitement into the events, formative evaluation data from Seasons 1 and 2 show that it is of least importance to participants when compared with the social aspects and training elements of the experience. Participants

Participants' Identity as a Science Communicator Before FameLab:

54% Very Strongly or Strongly

46% Somewhat or Not at All

Participants' Identity as a Science Communicator After FameLab:

87% Very Strongly or Strongly

13% Somewhat or Not at All

“ I feel the least important aspect was that we were competing. The connections we made and the training we received were priceless. ”

FameLab USA Season 1 participant

“ I now feel a greater sense of responsibility and ability to educate a broader spectrum of people about science. ”

FameLab USA Season 3 participant in Phoenix, AZ heat



overwhelmingly reported that meeting and bonding with like-minded people was the most important social aspect of FameLab (see Figure 9).

Anecdotal evidence indicates that most FameLab participants from a heat-cohort have established social media connections, and are active in one another's feeds as well as on the FameLab USA Facebook page. These observations show that the FameLab experience supports community building, which in turn bolsters the confidence and identity that participants gained through FameLab. This outcome supports NASA's goal of fostering a science community that will nurture science communicators throughout their careers.

Benefits of the social aspects of FameLab

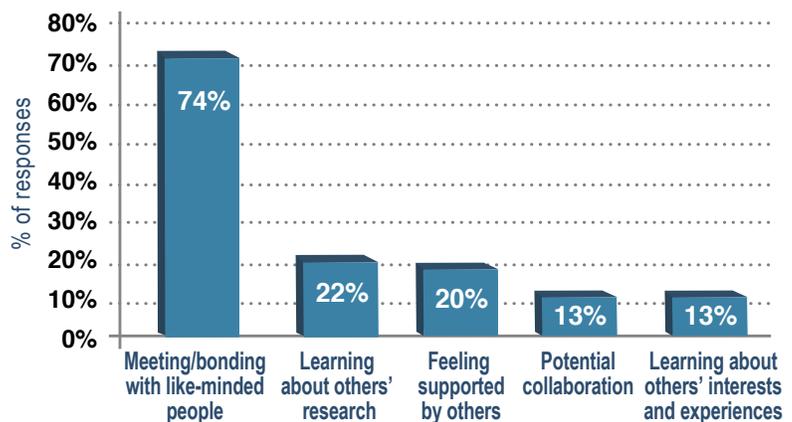


Figure 9. FameLab USA participants' reports of benefits of the social aspects of FameLab (N=46)



The Effects of Improved and Expanded Skills and Attitudes

According to the theory of change, the enduring effects of FameLab are strongest when changes in skill combine with changes in attitude (in this case, attitude toward confidence and identity). Because participants identified lack of time and lack of support from their institutions in the top three challenges to public communication that they face, the effect FameLab has had on their intention to meet these challenges was assessed.

In a post-FameLab survey, participants were asked to describe FameLab's impact on the likelihood that they will look for more opportunities to communicate about their science and meet any challenges presented by their home institution's environment (see Figures 10a and 10b). The data indicate that FameLab made a significant impact for participants in these areas.



85% Indicated a Big or Moderate Impact on the likelihood that they would seek more opportunities to communicate their science

52% Indicated a Big or Moderate Impact on meeting challenges presented by their home institutions

“ I have incorporated speaking techniques in my talks and presentations ... I am applying for many more speaking opportunities than I would have before. ”

FameLab USA Season 3 participant in San Francisco, CA heat

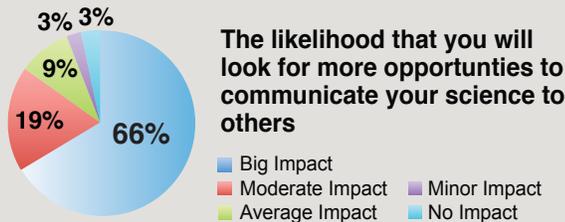


Figure 10a. FameLab USA's impact on the likelihood that participants will look for more opportunities to communicate their science to others (N=119)

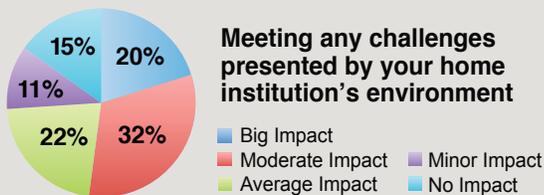


Figure 10b. FameLab USA's impact on the likelihood that participants will meet challenges presented by their home institutions (N=119)

In terms of the immediate effects of FameLab, participants put their communication skills to work right away. In an open-ended, post-FameLab survey administered several weeks after their regional heat took place, participants indicated whether they had been able to apply any of the principles they learned in the workshop to their daily communications and work. Data show the majority have already done so or intend to do so in the future (see Figure 11a). Season 3 participants were also asked which of the principles they had used (see Figure 11b).

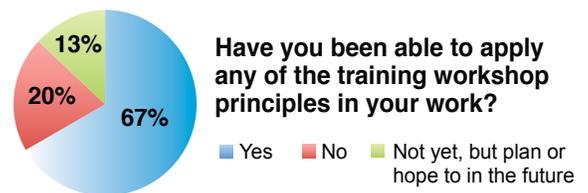


Figure 11a. FameLab USA participants' use of training workshop principles after FameLab (N=54)

Applying Principles Learned in Training

67% Have already applied principles from the workshops

13% Intend to do so

20% Have not yet had the opportunity to do so

Which Principles Were Applied

53% Making Content Relevant to my Audience

44% Using a Theme to Structure a Presentation

44% Crafting and Delivering a Strong Theme

“ All the time I find myself needing to communicate science not only to the public, but to other scientists who simply have a different specialty from me. The idea that I can explain my work to them more easily without ‘dumbing it down’ has been powerful for me in those situations. ”

FameLab USA Season 3, participant in Stony Brook, NY heat



Training workshop principles applied after FameLab

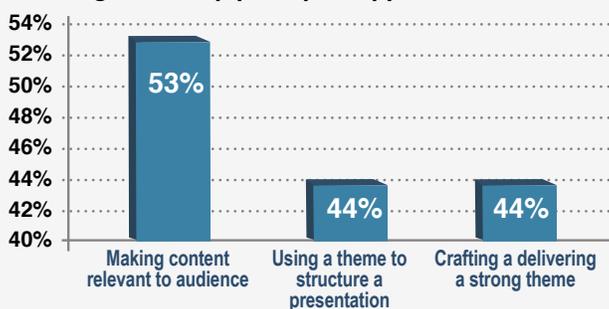


Figure 11b. Training workshop principles applied by participants after FameLab (N=36)

On the same survey, participants listed the ways in which they are using these principles to improve their daily communications:

- Casual discussions with other scientists
- Conference presentations
- Effective proposal writing
- Teaching skills
- Communication with lay audiences



Conclusion

FameLab USA has produced scientists who are better at communicating their work and are more likely to do so throughout their careers. The FameLab experience has impacted how participants will bring communication into their work in the future. FameLab has empowered them with increased skills and confidence to overcome challenges and seek out new opportunities to communicate about their work. NASA is proud to have been part of these transformations, and to have laid the foundation for a strong future for FameLab in the US.

<http://famelab.arc.nasa.gov/>

FameLab USA:

Web: <http://famelab.arc.nasa.gov>

Facebook: <https://www.facebook.com/famelabusa>

Twitter: @FameLab USA, <https://twitter.com/FameLabUSA>

YouTube: <https://www.youtube.com/user/FameLabUSA>

Flickr: <https://www.flickr.com/photos/131179790@N02/>



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